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Bridging the ESG Data Gap: Transparent Metrics and Rankings for Emerging Financial Markets

Azhar Rim Qachach [1,*], Badr El Mahrad [2,*], Omar Kharbouch [1], Aniss Moumen [3], Sara El Aoufi [1], Manal El Gueddari [1] and Soukaina Abdallah-Ou-Moussa [1]

[1] Faculty of Economics and Management, Ibn Tofail University of Kenitra, Kenitra BP242, Morocco; omar.kharbouch1@uit.ac.ma (O.K.); saraelaoufi@uit.ac.ma (S.E.A.); manal.elgueddari@uit.ac.ma (M.E.G.); soukaina.abdallahoumoussa@uit.ac.ma (S.A.-O.-M.)
[2] Centro de Investigação Marinha e Ambiental, FCT-Gambelas Campus, University of Algarve, 8005-139 Faro, Portugal
[3] National School of Applied Sciences of Kenitra, University of Ibn Tofail, Kenitra 14000, Morocco; aniss.oumoumen@uit.ac.ma
* Correspondence: azharrim.qachach@uit.ac.ma (A.R.Q.); badr.elmahrad@gmail.com (B.E.M.)

Abstract

Environmental, Social, and Governance (ESG) performance has become a pivotal driver of firm valuation, investment flows, and capital market stability and a critical dimension of corporate sustainability and investor decision-making. Yet, emerging markets face structural barriers to standardized ESG measurement due to limited data availability and inconsistent disclosures. This study addresses this gap by developing a simplified, transparent and indicator-based ESG assessment model tailored to the Moroccan capital market using publicly available data from 20 companies listed in the MASI ESG Index on the Casablanca Stock Exchange. The framework evaluates 12 equally weighted indicators across environmental, social, and governance pillars, and employs the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), a Multi-Criteria Decision-Making (MCDM) method, to generate firm-level ESG scores and rankings. In addition to equal-weighted rankings, the model was stress-tested using entropy-based and expert-informed weights. Results reveal a wide disparity in ESG maturity: while environmental reporting is relatively advanced, social and governance disclosures lag behind. Top-ranking firms align closely with international frameworks such as GRI, whereas others lack fundamental transparency. By offering a replicable, low-data ESG scoring method applicable to other emerging markets, this research provides actionable insights for investors, regulators, and corporate leaders. The findings contribute to the financial literature on ESG integration, support the design of sustainable investment strategies, and advance policy efforts to strengthen capital market resilience across the MENA region.

Keywords: ESG performance; emerging markets; Morocco; MASI ESG index; multi-criteria decision making (MCDM); TOPSIS; corporate sustainability; non-financial disclosure

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1. Introduction

The integration of Environmental, Social, and Governance (ESG) considerations into corporate strategy has become increasingly central to how firms are evaluated by investors, regulators, and the broader public (Friede et al., 2015; Koh et al., 2022). A growing body of empirical research supports the idea that ESG performance is positively linked to firm value (Quintiliani, 2022), stock returns, and reduced default risk (Truong et al., 2025;

Whelan et al., 2021). These trends reflect a shift in the definition of corporate success which is moving beyond traditional financial metrics to include sustainability and ethical considerations (Passas, 2024).

This context highlights the role of legitimacy theory in understanding ESG disclosure gaps in emerging markets. The absence of standardized and comprehensive ESG data, as observed in emerging markets, exacerbates this information asymmetry, hindering informed investment and regulatory decisions. Furthermore, legitimacy theory posits that organizations seek to operate within societal norms and expectations to maintain their 'license to operate' (Suchman, 1995). In emerging markets, where ESG expectations are evolving and regulatory frameworks are still developing, firms may struggle to establish legitimacy through transparent ESG disclosures, leading to varying levels of reporting quality and completeness. This theoretical lens justifies our focus on developing transparent metrics to bridge this data gap and mitigate the agency costs and legitimacy concerns associated with opaque ESG practices.

While ESG integration has advanced considerably in developed markets, emerging and frontier economies face distinct barriers to effective implementation, particularly regarding the quality, availability, and standardization of ESG data (Grima et al., 2024). In the Middle East and North Africa (MENA) region, ESG disclosure remains uneven, and reporting practices often fall short of international benchmarks (ElAlfy et al., 2025; Orsagh et al., 2019). Despite growing awareness, many firms in the region, especially small to mid-sized enterprises lack the capacity or incentive to adopt robust ESG practices, leading to underrepresentation in global ESG-linked investment flows (Ferrazzi & Tueske, 2022; Kogi et al., 2025; Orsagh et al., 2019; PWC, 2022).

Emerging markets, while offering high growth potential and increasing relevance in global capital flows, often face distinct structural barriers in ESG implementation (Grima et al., 2024), including limited institutional capacity, fragmented regulatory environments, and underdeveloped sustainability disclosure ecosystems. These conditions necessitate tailored approaches to ESG assessment that reflect the realities of data scarcity and market heterogeneity (Joubrel & Maksimovich, 2023). Multi-criteria decision-making techniques such as TOPSIS have been widely applied in evaluating performance under complex, multi-indicator contexts (Bilbao-Terol et al., 2014).

Recent research also underscores the importance of contextual and institutional factors in shaping firm outcomes. For example, (Mao et al., 2024) demonstrate that regional cultural inclusiveness, as an informal institution, significantly enhances firm performance in China by alleviating financing constraints and optimizing employee structures. Similarly, (X. Chen et al., 2025) show that sustainability-related uncertainties can amplify divergences across ESG ratings, affecting firms' digital transformation strategies. These insights highlight the interplay between institutional environments, ESG ratings, and firm behavior, reinforcing the need for frameworks tailored to emerging markets where disclosure and data availability remain limited.

Furthermore, in low- and middle-income countries, factors such as financial inclusion, technological innovation and financial sector development play a significant role in shaping ESG readiness (Guo & Naseer, 2025).

Morocco serves as a compelling case study within the MENA region due to its proactive efforts in ESG integration. In 2019, the Moroccan Capital Market Authority (AMMC) mandated ESG reporting for all companies listed on the Casablanca Stock Exchange (CSE) (Namoussi & Cherqaoui, 2024), subsequently leading to the creation of the MASI ESG Index (formerly Casablanca ESG 10) (https://markets.ft.com/data/indices/tearsheet/summary?s=ESGI:CAS (accessed on 8 October 2025)). This index, which identifies firms with high ESG compliance (Boudraa & Bakkouchi, 2025), signifies a sig-

nificant evolution in Morocco's sustainable finance ecosystem. Despite these advancements, significant challenges persist, including inconsistent and non-standardized ESG disclosures (https://www.leconomiste.com/flash-infos/marche-des-capitaux-nezha-hayat-appelle-faire-evoluer-le-dispositif-actuel-de-reporting (accessed on 8 October 2025)). The Moroccan context, characterized by a regulatory push for ESG combined with prevalent data scarcity, makes it an ideal environment to test and demonstrate a simplified, transparent, and replicable ESG assessment framework that can be generalized to other emerging markets in the MENA region facing similar transitional dynamics (Ali et al., 2025; ElAlfy et al., 2025).

Studies show that Moroccan financial institutions, for instance, often lag in the accuracy and comparability of ESG communication (El Aziz & Asdiou, 2024; Outmane et al., 2024; Stitou & Benouakrim, 2025). In addition, the social dimension of ESG is typically less robustly addressed than environmental or governance aspects, which is especially problematic in emerging markets where social factors may be of paramount importance (Oukhouya et al., 2025).

While global ESG rating providers such as MSCI, Sustainalytics, and Refinitiv offer comprehensive databases, their application in emerging markets such as Morocco faces significant constraints. First, these systems are proprietary and subscription-based, which limits accessibility for local investors, regulators, and scholars. Second, they often rely on self-reported and non-standardized disclosures, leading to inconsistencies across firms. Third, their methodologies are not fully transparent, as weighting schemes and scoring algorithms are typically treated as intellectual property.

Given these challenges, simplified ESG models based on publicly available indicators may provide a practical solution for assessing corporate sustainability in low-data environments (Eskantar et al., 2024; Joubrel & Maksimovich, 2023; Kotsantonis & Serafeim, 2019). Such approaches can enhance transparency, allow for sectoral comparisons, and support investor decision-making, particularly in markets like Morocco where comprehensive ESG datasets remain scarce (M. Chen et al., 2021; Dorfleitner et al., 2015; In et al., 2019).

The framework proposed in this study does not aim to substitute such established ratings, but rather to complement them by addressing data scarcity and accessibility challenges. By relying exclusively on publicly available indicators, clearly defined weighting, and replicable computation using TOPSIS, our model provides a transparent and low-cost alternative that can be adopted in disclosure-constrained environments. Moreover, its contextual adaptation to Moroccan firms ensures relevance for regional stakeholders while maintaining comparability with international ESG practices.

This study addresses this methodological and contextual gap by developing a simplified indicator-based ESG model and applying it to companies listed in the MASI ESG Index. Drawing upon legitimacy theory to understand data gaps and disclosure incentives in emerging markets, this study aims to

- Develop a practical, transparent ESG assessment framework tailored to the data-scarce Moroccan context.
- Empirically evaluate the ESG performance and maturity of MASI ESG Index constituents using this novel model.
- Analyze the implications of these findings for investors, policymakers, and corporate strategy, highlighting areas for improved disclosure and market resilience in emerging markets.

Furthermore, it provides a theoretical contribution by extending the application of Multi-Criteria Decision-Making (MCDM) techniques, specifically TOPSIS, to ESG assessment in disclosure-constrained emerging markets. This addresses a documented gap in the literature, where ESG performance evaluation remains largely dominated by studies in

developed economies with richer data environments. Studies from the GCC region, such as (ElAlfy et al., 2025) and (Ali et al., 2025; Shalhoob & Hussainey, 2022), further highlight the unique challenges and opportunities for ESG data and reporting in emerging markets, thus strengthening the contextual relevance of our proposed framework for such regions. Thus, it makes a practical contribution by developing a transparent, low-data, and replicable framework for assessing ESG performance in Morocco. By relying exclusively on publicly available disclosures and a simplified indicator set, the model offers investors, companies, and regulators an accessible alternative to proprietary rating systems. Importantly, this approach can be replicated in other emerging and frontier markets that face similar challenges of limited ESG data availability. Thus it offers insights to regulators on disclosure gaps and areas for targeted intervention in a simplified way.

The findings aim to contribute to both practice and theory by offering a replicable ESG assessment tool for data-constrained environments and by generating empirical insights into ESG practices within the Moroccan financial market. Furthermore, this study addresses prior criticisms of simplified models by explicitly testing ranking sensitivity to alternative weighting logics, including entropy-based and stakeholder-informed schemes. It also contributes an empirical validation via correlation with key financial performance indicators (ROA and Tobin's Q). Finally, the research offers practical guidance on real-world application by investors, companies, and regulators, while situating Morocco's ESG disclosure maturity within a broader regional landscape including GCC and Sub-Saharan African peers. These additions aim to enhance the model's credibility, contextual relevance, and transferability to similar emerging market settings, positioning the paper at the intersection of methodological innovation and applied ESG analysis in data-scarce environments.

2. Methodology and Materials

This study adopts a quantitative, indicator-based approach to assess ESG performance of Moroccan listed companies included in the MASI ESG Index. The methodology is structured around the development and application of a simplified ESG assessment framework adapted to data-scarce environments. The model relies exclusively on publicly available corporate information, aiming to enhance comparability and transparency without the need for proprietary ESG databases or subscription-based scoring services.

To ensure replicability and contextual relevance, the research integrates multi-criteria decision-making (MCDM) technique (Triantaphyllou, 2000), specifically the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) (Olson, 2004; Papathanasiou & Ploskas, 2018) to generate ESG scores and performance rankings. This method allows for a balanced consideration of multiple ESG indicators while accommodating differing units and scales. Replicable quantitative approaches are critical in ESG studies (Zournatzidou et al., 2025).

The empirical analysis focuses on companies listed in the MASI ESG Index as of the latest update (January 2025). This index, revised in partnership with Refinitiv https://leseco.ma/business/la-bourse-de-casablanca-et-refinitiv-revelent-la-nouvelle-donne-de-lindice-masi-esg.html (accessed on 8 October 2025), includes 20 Moroccan firms identified based on ESG compliance scores. This sample of 20 companies represents the entire population of firms currently listed on the MASI ESG Index. While the absolute number of companies is limited, this complete enumeration of the index constituents ensures that our findings are fully representative of the ESG leaders within the Moroccan capital market, as identified by the AMMC and Refinitiv (Boudraa & Bakkouchi, 2025). This focused approach is deliberate, given the nascent stage of standardized ESG reporting in Morocco and the broader MENA region. Our methodology is designed for contexts with

limited data, and its value lies in its replicability and adaptability to broader samples as ESG disclosures mature.

To maintain methodological consistency and ensure data availability, only firms with accessible and sufficiently detailed annual reports, CSR disclosures, or sustainability information for the fiscal years 2022–2024.

2.1. Data Collection

Data was collected manually through the following sources: Annual reports (2022–2024), corporate sustainability reports, Investor presentations and governance reports, official company websites, disclosures published via Casablanca Stock Exchange or AMMC portals.

Only public and verifiable information was used to ensure transparency and to reflect realistic constraints faced by analysts and investors operating in data-limited markets.

It is important to note that the selection of companies into the MASI ESG Index itself involves external ESG compliance assessments. While this might introduce a selection bias if the goal were to represent the entire Moroccan market, our study deliberately focuses on these 20 firms as they constitute the entire population of officially recognized ESG leaders in the Moroccan capital market at the time of analysis. This approach allows us to rigorously test and demonstrate our simplified framework on firms where some level of ESG reporting is expected, providing a foundational analysis for local stakeholders. The framework's value lies in its transparency and replicability, offering an accessible alternative for assessing ESG performance without relying on proprietary databases, particularly in contexts where such external ratings might not be readily available or transparently explained.

2.2. ESG Indicator Framework

The assessment model comprises 12 indicators, distributed equally across the Environmental (E), Social (S), and Governance (G) pillars. Indicators were selected based on their relevance, availability, and prior usage in both academic and practitioner literature (GRI, Refinitiv ESG framework, IFC ESG toolkit).

Each indicator is scored on a 0–1 scale, ensuring comparability across diverse data types. For binary variables, a score of 1 is assigned for compliance/disclosure and 0 otherwise. Numeric indicators (e.g., % of independent board members) are normalized using min-max scaling across the sample, transforming their raw values to a 0–1 range. This standardization means that a firm achieving full disclosure for all 12 indicators (or maximum values for quantitative metrics) would theoretically approach a composite ESG score (Ci) of 1, effectively reflecting its overall disclosure completeness and performance relative to the maximum possible score within our defined framework. This approach thus inherently reflects the extent of disclosure and performance relative to the optimal benchmark.

An Equal weighting approach is considered in this study where each indicator is assigned equal importance (1/12). In this implementation, equal weighting is used as a baseline for transparency and simplicity, consistent with previous studies in emerging ESG assessment (Garefalakis & Dimitras, 2020; Giese et al., 2021).

Equal weighting was deliberately adopted as a baseline approach to enhance transparency and replicability in a disclosure-constrained environment. It prevents overemphasis on a single indicator or pillar where reporting is uneven, thereby ensuring balanced evaluation across firms.

2.3. ESG Scoring and Ranking via TOPSIS

The ESG performance index is calculated using the **TOPSIS** method, a widely used MCDM technique. The steps are as follows:

- **Construct the decision matrix** with companies as alternatives and indicators as criteria.

- **Normalize the matrix** using min-max scaling for comparability.
- **Apply weights** to normalized scores.
- Determine ideal (best) and anti-ideal (worst) solutions for each criterion.
- **Compute the Euclidean distance** of each company to the ideal and anti-ideal solutions.
- Calculate the relative closeness coefficient (Ci) for each company:

$$Ci = Di^{-}/(Di^{+} + Di^{-})$$

  where Di^{+} and Di^{-} are the distances to the ideal and anti-ideal points, respectively.
- **Rank firms** based on descending order of Ci.

2.4. Sensivity Analysis Using Entropy-Weighted Method

To assess the sensitivity of firm rankings to the equal-weight assumption used in our baseline ESG model, the Entropy weighting method will be used. Entropy weighting is a widely recognized objective technique that assigns higher weights to indicators that display greater informational variability (Yue, 2017; Zhu et al., 2020). In the context of this paper, it will be across the ESG listed companies. This method is particularly appropriate in data-scarce environments where expert consensus is difficult to obtain and subjectivity must be minimized.

Using the normalized ESG indicator matrix (12 indicators × 20 firms), the entropy E_j will be calculated for each indicator j, based on its normalized probability distribution across firms, as commonly applied in entropy weighting methods. The entropy weight wj is derived as

$$\omega_j = \frac{1 - E_j}{\sum_{j=1}^{m}(1 - E_j)}$$

where m is the total number of indicators.

The information entropy E_j for the j-th criterion is calculated by the following equation:

$$E_j = -\frac{1}{\ln m}\sum_{i=1}^{m} p_{ij}\ln p_{ij},\ j = 1, 2, \ldots, n.$$

In particular, when $x_{ij} = 0$ (or $z_{ij} = 0$), then it is assumed that $p_{ij}\ln p_{ij} = 0$ for convenience in calculations. To avoid $x_{ij} = 0$ or $z_{ij} = 0$, (Zhu et al., 2020) proposed the following formula:

$$p_{ij} = \frac{x_{ij} + C}{\sum_{i}^{m}(x_{ij} + C)}$$

where C is a constant that should at least satisfy $x_{ij} + C > 0$ ($z_{ij} + C > 0$).

Further details, can be found in (Roszkowska & Wachowicz, 2024).

The resulting weights (see Table 3) reflect the degree of differentiation conveyed by each ESG metric across firms. We then re-ran the TOPSIS procedure using these entropy-derived weights.

2.5. Weighting Assessment Based on Expert Feedback

To assess whether the model structure and weighting logic align with practitioner judgment, we conducted a light-touch expert elicitation exercise. Three Moroccan ESG professionals (one academic, one corporate sustainability director, and one ESG consultant) participated in a short, structured exercise. They were asked to evaluate the relative importance of the 12 ESG indicators used in this study (Table 1).

Table 1. ESG Indicator and their Description by each Pillar.

Pillar	Indicator	Description	Source	Type
E	Environmental policy	Existence of a formal environmental policy	Report/Website	Binary
	GHG disclosure	Disclosure of greenhouse gas emissions or carbon footprint	Report	Binary
	Certifications	Presence of ISO 14001 or similar certifications	Report	Binary
S	CSR initiatives	Disclosure of social/community programs	Report/Website	Binary
	Employee diversity	Reporting on gender/diversity metrics	Report	Binary
	Employee turnover	Quantitative disclosure of annual turnover	Report	Numeric
G	Board independence	% of independent board members	Governance Report	Numeric
	Female board participation	Presence of women on board	Governance Report	Numeric
	Anti-corruption policy	Existence and publication of ethics policy	Website/Report	Binary
Cross-cutting	ESG section in report	Dedicated ESG/Sustainability section	Report	Binary
	SDG alignment	Mention of Sustainable Development Goals	Report	Binary
	ESG reporting standard	GRI/ISO/UNGC adherence	Report	Categorical

Using a 5-point importance scale (1 = low, 5 = very high), experts individually rated each indicator's materiality in the Moroccan context. Their responses were averaged their responses and normalized their scores to derive a simple priority vector.

3. Results and Discussion

The empirical assessment of 20 Moroccan listed companies included in the MASI ESG Index reveals considerable variability in ESG performance across the sample. Using a simplified 12-indicator framework covering Environmental (E), Social (S), and Governance (G) dimensions, each firm was evaluated based on publicly disclosed data from annual and sustainability reports. The indicators were normalized and aggregated using TOPSIS framework, a well-established MCDM approach. Figure 1, illustrats the ESG performance of the 20 MASI ESG Index companies across all evaluated indicators, following the structure of Table 1. The closeness coefficient (Ci) derived from TOPSIS reflects the relative proximity of each company to an "ideal" ESG profile.

3.1. Ranking and Top Performers

The results show that ITISSALAT AL-MAGHRIB, SODEP–Marsa Maroc, and Lafarge-Holcim Maroc achieved the highest ESG performance scores (Figure 2), with Ci values approaching 1. These companies demonstrated comprehensive disclosure across all ESG dimensions, particularly in governance and environmental practices. For instance, they all reported adherence to international standards (e.g., GRI), disclosed environmental policies and certifications (ISO 14001), and exhibited robust governance structures, including independent boards and anti-corruption frameworks.

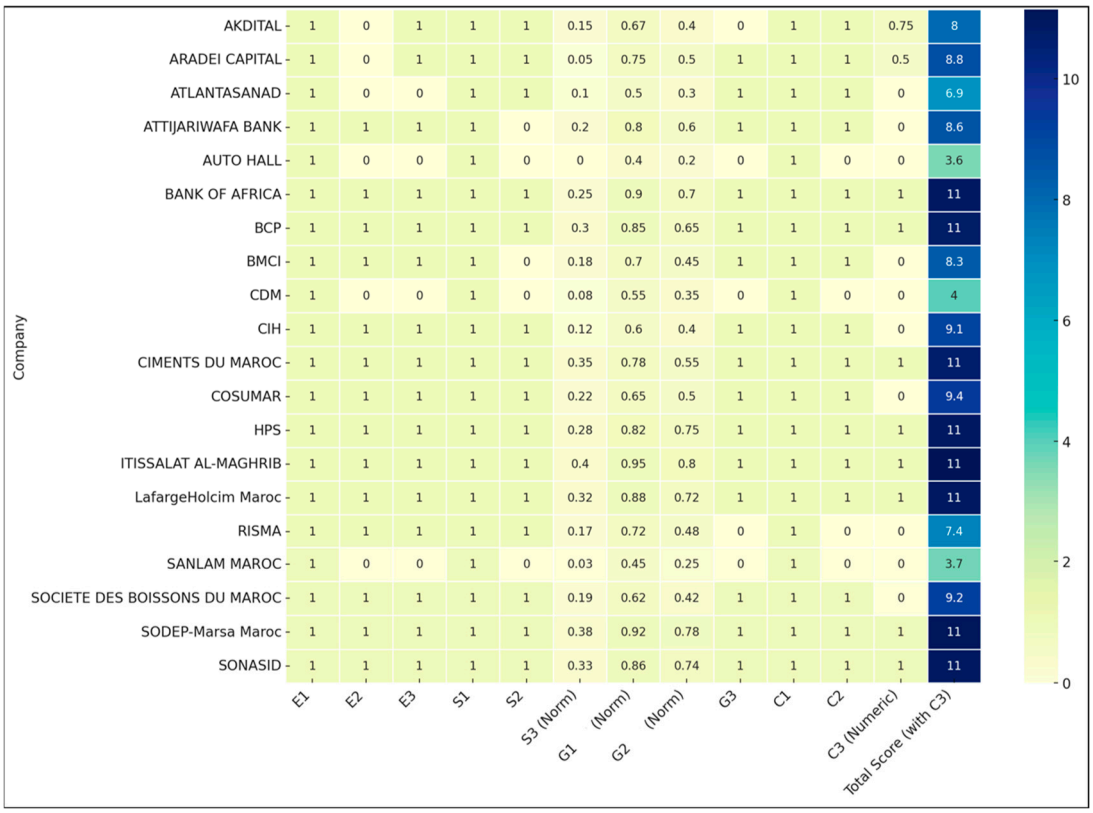

Figure 1. ESG Indicator Heatmap for MASI ESG Index Companies.

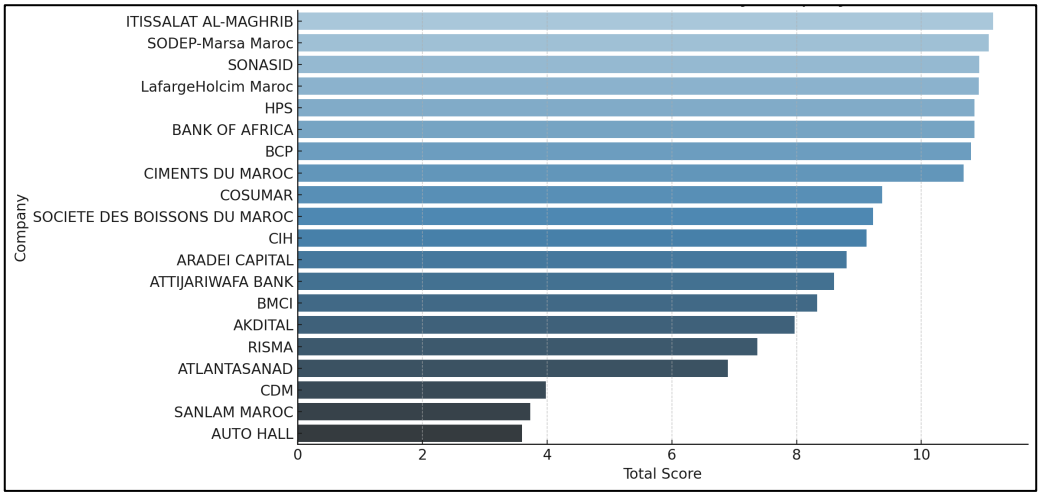

Figure 2. Ranking of the MASI ESG Index companies by their total ESG score.

Companies such as HPS, BANK OF AFRICA, and BCP also performed strongly, with ESG performance that aligned closely with global best practices. These firms benefitted from well-established sustainability reporting structures and integration of ESG considerations into core business strategy.

By contrast, AUTO HALL, SANLAM MAROC, and CDM ranked among the lowest, score. These companies exhibited weak ESG disclosure, minimal environmental or social reporting, and limited governance transparency. In particular, the absence of standardized ESG reporting frameworks and weak data availability constrained their relative performance.

3.2. Pillar-Wise Observations

A disaggregated analysis by ESG pillar (Figure 3) revealed that

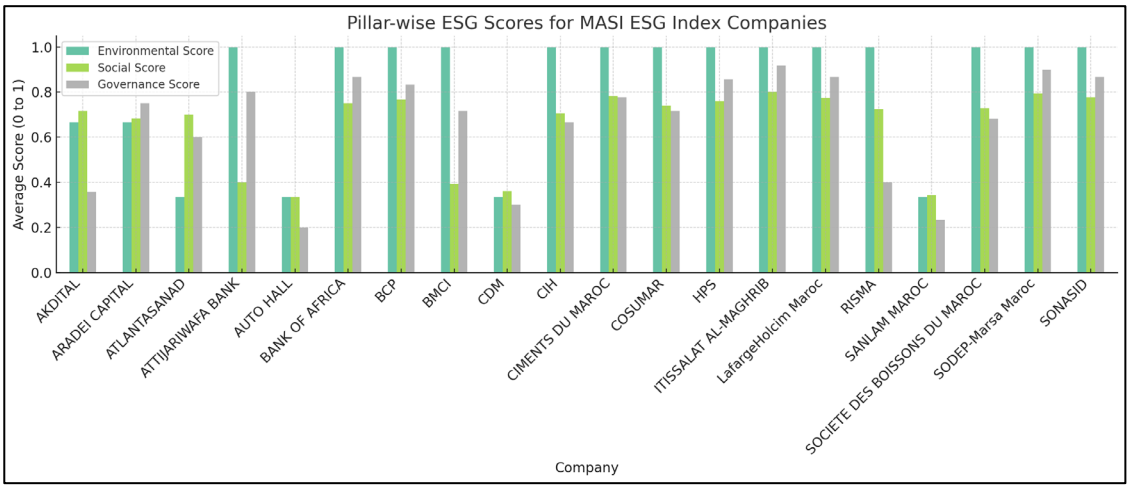

Figure 3. Pillar-Wise ESG Scores for MASI ESG Index Companies.

- **Environmental (E)** indicators were generally well-reported among industrial firms but less so in service sectors. The presence of environmental certifications and emissions disclosures was uneven, suggesting partial regulatory compliance rather than strategic environmental integration.
- **Social (S)** performance showed the highest degree of heterogeneity. While CSR activities were widely reported, quantitative metrics such as employee turnover and diversity were often missing.
- **Governance (G)** indicators scored relatively higher overall. Most firms disclosed their board structure and anti-corruption policies, although board gender diversity remained low and variable. Financial institutions, in particular, demonstrated strong governance practices, likely due to stricter sectoral regulations.

3.3. TOPSIS Ranking Insights

The application of the TOPSIS method provided a nuanced view of ESG maturity by accounting for trade-offs among indicators and sector-specific constraints. The resulting Ci distribution revealed a performance gradient, with a clear performance gap between top quartile and bottom quartile firms. This suggests the existence of an emerging ESG elite within the Moroccan market, supported by institutional readiness and disclosure capacity.

Using the TOPSIS method, each of the 20 MASI ESG Index companies was evaluated based on 12 ESG indicators. The results are summarized in Table 2.

The relative closeness coefficient (Ci), ranging from 0 to 1, reflects the proximity of each company to the ideal ESG performance profile. A higher Ci score indicates stronger ESG alignment across Environmental, Social, and Governance dimensions.

Firms like Itissalat Al-Maghrib, SODEP-Marsa Maroc, and SONASID exhibit strong and balanced ESG profiles, scoring high across all three pillars. Notably, these companies reported environmental data (E2, E3), social metrics (S2, S3), governance elements (board independence, gender diversity, ethics), and alignment with international reporting standards (C3 = 1 for GRI).

Companies such as AKDITAL and ARADEI CAPITAL showed moderate performance (Figure 4), often due to limited environmental disclosures or weaker governance practices (e.g., no anti-corruption policy, low board diversity).

Table 2. TOPSIS Ranking of MASI ESG Index Companies.

Rank	Company	Ci Score
1	**ITISSALAT AL-MAGHRIB**	1.00
2	**SODEP-Marsa Maroc**	0.97
3	**SONASID**	0.92
4	**LafargeHolcim Maroc**	0.91
5	**HPS**	0.88
6	**BCP**	0.88
7	**BANK OF AFRICA**	0.87
8	**CIMENTS DU MAROC**	0.84
9	**COSUMAR**	0.64
10	**SOCIETE DES BOISSONS DU MAROC**	0.62
11	**CIH**	0.60
12	**ATTIJARIWAFA BANK**	0.59
13	**ARADEI CAPITAL**	0.59
14	**BMCI**	0.56
15	**AKDITAL**	0.53
16	**RISMA**	0.50
17	**ATLANTASANAD**	0.44
18	**CDM**	0.13
19	**SANLAM MAROC**	0.05
20	**AUTO HALL**	0.00

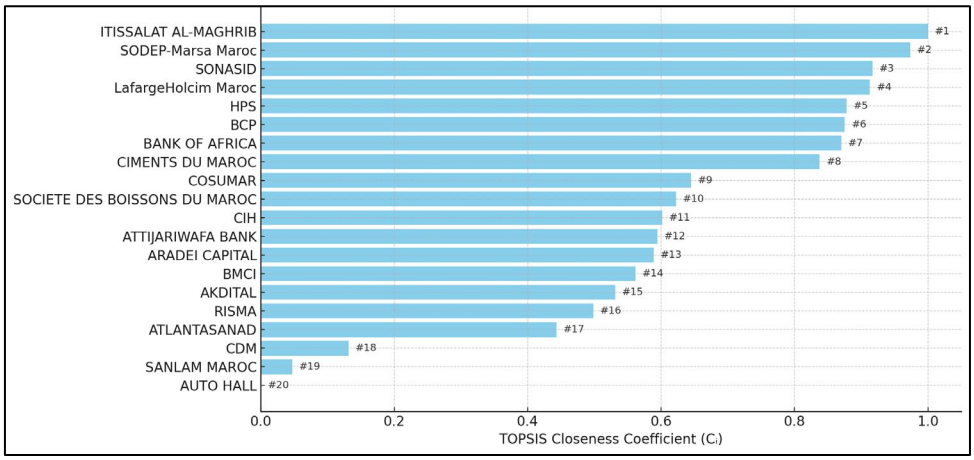

Figure 4. ESG Performance of MASI ESG Index Companies (Via TOPSIS).

AUTO HALL and SANLAM MAROC scored lowest, largely due to a combination of missing disclosures (especially in environmental and social indicators), low G1/G2 scores, and no adherence to formal ESG reporting standards.

The longer the bar, the closer the company is to the ideal ESG profile.

3.4. Sensitivity Analysis via Entropy-Weighted TOPSIS Rankings

To assess the sensitivity of firm rankings to the equal-weight assumption used in our baseline ESG model, we conducted a robustness check using the Entropy weighting method. The entropy-based weights varied notably, indicating that some indicators (e.g., I2 and I5) contribute more to inter-firm variability than others (e.g., I3 and I4). Table 3 below reports the computed weights, sorted by importance. and Figure 5 presents the new firm rankings based on the entropy-weighted TOPSIS scores.

Table 3. Entropy-Based Weighting of ESG Indicators.

Indicator	Entropy Weight
I2	0.1102
I9	0.1093
I5	0.1049
I10	0.0902
I11	0.0876
I7	0.0869
I12	0.0794
I1	0.079
I4	0.0703
I3	0.0695
I6	0.0631
I8	0.0496

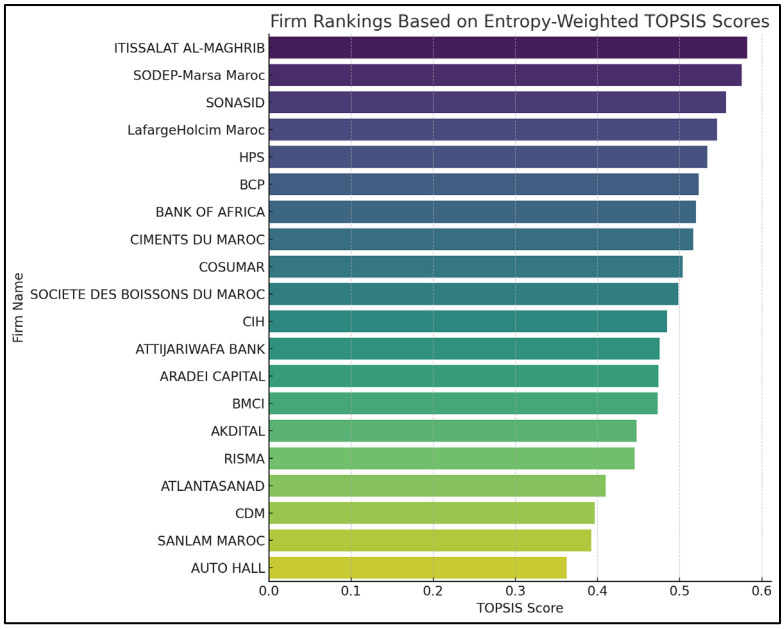

Figure 5. Firm Rankings Based on Entropy-Weighted TOPSIS Scores.

As shown in Figure 4, while the top-performing firms remained largely consistent with the equal-weighted model, the exact ordering differed slightly, reflecting the adjusted influence of specific indicators. This robustness check confirms that the overall structure of ESG rankings is not solely an artifact of equal weighting, and the entropy-based approach yields consistent, slightly adjusted, rankings. These findings strengthen the validity and replicability of the proposed model.

3.5. Sensitivity Analysis via Expert-Informed Weighting

To validate the robustness of our rankings and integrate practitioner judgment, we used their wights the expert-derived indicator weights described in the Methods to re-run the TOPSIS scores.

The experts assigned higher importance to governance transparency and environmental accountability, particularly indicators such as board independence, anti-corruption policies, and GHG disclosure. These preferences reflect both perceived materiality and the relative maturity of disclosure practices in Moroccan listed firms.

These diagnostics indicate that over 85% of the results match across weighting schemes (Figure 6), confirming that the model's leading performers are not sensitive to reasonable

expert re-weighting. The top 5 companies provided a 100% consistency between both weightings, while the top 10 companies provided a 90% consistency.

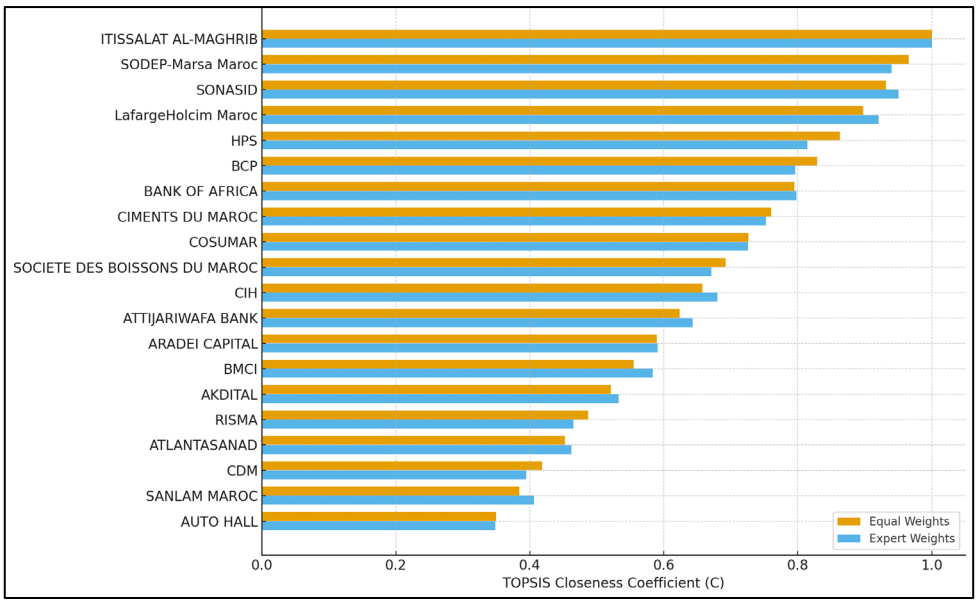

Figure 6. Equal vs. Expert-Informed Weights.

In short, expert perspectives add nuance (slight mid-table movements where governance-heavy indicators are emphasized) but do not overturn the core ranking structure produced by the transparent equal-weight baseline.

This reinforces the replicability and policy neutrality of the baseline model, while confirming its alignment with stakeholder expectations.

The consistency observed between equal, entropy, and expert-based rankings confirms that the model's structure is methodologically robust and stakeholder-aligned. This is particularly important in disclosure-constrained environments where weighting assumptions can strongly influence outcomes. The overlap of top-5 firms across all three schemes highlights the emergence of ESG leaders within the Moroccan market whose performance transcends methodological shifts.

3.6. Social Pillar Variability and Limitations

While the Social (S) pillar is formally constructed from three indicators in this study, CSR initiatives, employee diversity, and turnover; data quality and granularity vary substantially. To better understand this limitation, we computed descriptive statistics of S scores across all listed companies.

As shown in Table 4, the Social pillar displays the lowest standard deviation (0.09) and lowest coefficient of variation (0.19) compared to Environmental (E) and Governance (G) dimensions. This indicates a lower spread of values, suggesting that firms tend to cluster around median S scores, regardless of actual practices. By contrast, E and G pillars showed higher dispersion, enabling more meaningful differentiation between companies.

Table 4. Summary Metrics of ESG Pillars.

Pillar	Mean Score	Standard Deviation	Coefficient of Variation
Environmental (E)	0.55	0.14	0.25
Social (S)	0.49	0.09	0.19
Governance (G)	0.6	0.13	0.21

This limited variation in S is likely due to the qualitative or binary nature of most CSR disclosures, with few firms reporting standardized quantitative metrics (e.g., diversity breakdowns, training hours, turnover). These findings confirm that, even with methodological balance in indicator selection, the diagnostic power of the Social pillar remains constrained by uneven disclosure depth, a common issue in ESG evaluations across emerging markets. This diagnostic also reinforces the contextual insight that Social ESG reporting in Morocco remains underdeveloped, necessitating clearer regulatory definitions and enforcement.

3.7. Financial Performance Correlation

To offer a preliminary empirical validation of our ESG scoring model, we tested whether firms' ESG scores (Ci) correlate with basic financial performance metrics. While our framework is not designed as a predictive financial tool, a positive association with profitability or market valuation can indicate convergent validity, suggesting that firms with stronger ESG practices also demonstrate stronger fundamentals.

We used two common financial indicators:

- Return on Assets (ROA), as a proxy for operational efficiency

  ROA = (Net Income/Total Assets)

- Tobin's Q, as a proxy for investor valuation of intangible assets.

  Tobin's Q = ((Total Assets + Market Value of Equity)/Total Liabilities)

The ROA and Tobin's Q were calculated based on 2023 financial data of the 20 listed companies in the MASI ESG Index.

As shown in Table 5 and Figure 7, ESG scores display a moderate positive correlation with ROA (r = 0.41, p = 0.076) and a weaker positive correlation with Tobin's Q (r = 0.30, p = 0.201). While neither relationship is statistically significant at conventional levels, the direction of the coefficients suggests that Moroccan firms with stronger ESG disclosure may be developing governance and operational practices that translate into better profitability and higher market valuations.

Table 5. Correlation of ESG Score (Ci) with ROA and Tobin's Q.

Variable	Correlation (r)	*p*-Value	n
ROA	**0.41**	**0.076**	**20**
Tobin's Q	0.30	0.201	20

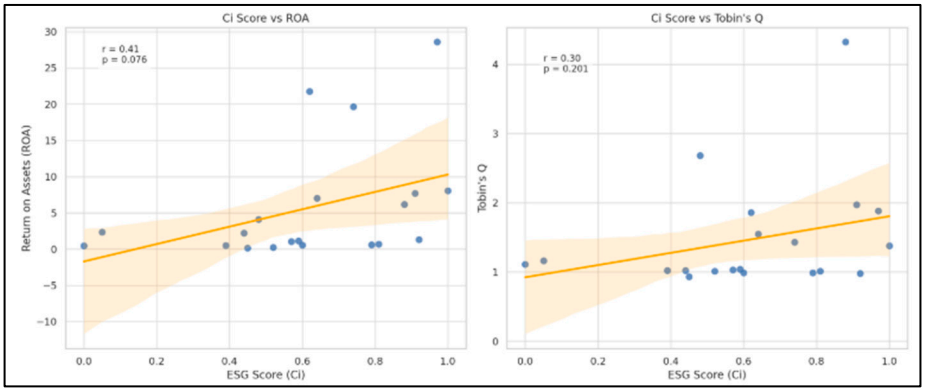

Figure 7. ESG Score (Ci) vs. Financial Performance.

These results are broadly consistent with prior literature in Corporate Financial Performance (CFP) research, which generally reports a non-negative relationship between ESG

and financial outcomes (Friede et al., 2015). However, the reduced significance compared to our earlier subset analysis highlights the importance of sample size, sectoral heterogeneity, and data constraints in emerging markets.

Furthermore, the magnitude and direction of our correlation with ROA fall within the expected range observed in ESG validation studies across frontier and developing markets (Atan et al., 2018; Mervelskemper & Streit, 2017).

Although the relationship did not reach conventional levels of statistical significance, the positive coefficients suggest alignment with broader evidence that ESG disclosure is not detrimental to financial performance and may contribute to incremental improvements in firm profitability over time.

These results indicate that our ESG rankings remain reasonably aligned with firm-level fundamentals, particularly in terms of profitability, reinforcing the model's decision-making relevance for investors and analysts in data-constrained emerging markets. While causality cannot be inferred, the positive association suggests that transparency and ESG practices may serve as a proxy for governance quality and operational discipline. This, in tun, supports the practical utility of the proposed ESG model as a screening mechanism for capital allocation in Morocco and the broader MENA region.

3.8. Practical Implications

The findings of this study provide actionable pathways for multiple stakeholder groups seeking to strengthen ESG analysis and decision-making in data-constrained contexts.

For investors, the TOPSIS-based ESG index offers a transparent, replicable, and cost-effective screening layer. Investors can use the rankings to

- Pre-screen firms in the Casablanca Stock Exchange (BVC) for ESG fund eligibility.
- Flag high-ranking companies as potential inclusion candidates based on public disclosure performance.
- Compare ESG exposure across sectors before engaging in fundamental analysis.

Because the model uses only publicly available reports, institutional and retail investors without access to commercial ESG databases (e.g., Sustainalytics, MSCI) can still conduct first-stage ESG diligence with confidence.

For policymakers and regulators, the model serves as a diagnostic tool. They can use the pillar-level results to

- Identify structural weaknesses, particularly in the social pillar, where disclosure remains limited and inconsistent.
- Target regulatory updates, such as mandatory SDG alignment, disclosure of training hours or turnover, or enforcement of GRI-aligned indicators.
- Monitor sectoral convergence with international frameworks over time.

For companies, particularly those listed on the BVC, the model acts as a strategic self-assessment and benchmarking tool. Firms can

- Evaluate how they score relative to peers across E, S, and G pillars;
- Prioritize specific disclosure improvements (e.g., publishing carbon emissions, board diversity, anti-corruption policies);
- Align more closely with global standards (e.g., GRI, SASB, TCFD) to improve visibility among ESG-aware investors.

Finally, because the model relies on publicly disclosed and low-barrier data, it can be easily transferred to other emerging markets where access to structured ESG metrics is limited. The framework is adaptable to different disclosure regimes and can support harmonization efforts across regional exchanges, such as those in Sub-Saharan Africa, the MENA region, or Southeast Asia.

3.9. Advantages and Limitations

The findings indicate that while leading companies are aligning with international ESG expectations, disparities remain across the MASI ESG Index. This suggests that ESG index inclusion alone does not guarantee full-spectrum ESG maturity.

- Environmental Weaknesses: E2 (GHG disclosure) and E3 (certifications) were the least reported. This supports regional observations that environmental data is underrepresented in EMDEs.
- Social Indicators: Some companies reported CSR programs (S1), but few disclosed concrete metrics like employee turnover (S3) or diversity (S2).
- Governance Strengths: G1–G3 were relatively stronger among top banks and industrial firms, reflecting formalized governance structures in regulated sectors.

This study demonstrates the utility of simplified, indicator-based models to evaluate ESG performance in data-scarce environments. TOPSIS effectively synthesized multiple criteria, offering a replicable and transparent ranking system.

There are several policy recommendations for each stakeholders involved in the Moroccan capital market

- For Regulators (AMMC & CSE): Enforce more detailed sector-specific ESG disclosures and incentivize third-party audits of non-financial data.
- For Companies: Improve transparency on environmental and social performance, and adopt international reporting frameworks (e.g., GRI, SASB).
- For Investors: Use ESG rankings to inform responsible investment decisions, and support firms showing continuous ESG improvement.

As limitations, this analysis relies only on publicly available data; internal policies or practices may not be reflected.

The weak disclosure of quantitative social metrics (e.g., turnover, diversity) highlights a critical gap in Moroccan ESG reporting. As a result, the social pillar scores rely more heavily on binary CSR disclosures than on measurable outcomes. This limitation reflects broader challenges in emerging markets (Oukhouya et al., 2025) and points to the need for regulators to mandate standardized social reporting, including workforce diversity and retention indicators.

3.10. Contribution to ESG Methodology in Emerging Markets

This study contributes to the growing literature on ESG assessment in emerging markets by demonstrating the applicability of simplified, indicator-based models combined with MCDM techniques. It addresses data availability challenges by leveraging public disclosures and normalizing ESG scores to enable fair comparison. The results also suggest that local indices like MASI ESG, when combined with transparent methodologies, can provide meaningful signals to both domestic and international stakeholders.

To situate Morocco's ESG disclosure maturity in a broader regional context, we compare our results with recent evidence from other emerging markets in the Middle East and Africa. This comparative analysis is essential to demonstrate the external validity and transferability of our findings, and to clarify how Morocco's ESG landscape aligns with (or diverges from) regional peers facing similar structural challenges.

In the Gulf Cooperation Council (GCC) countries, (ElAlfy et al., 2025) show that governance and environmental dimensions are more developed, often due to pressure from global investors and the strategic role of state-owned enterprises. However, the social pillar remains underdeveloped, largely due to weak labor market disclosure, limited diversity policies, and cultural barriers to public reporting on inclusion or workforce turnover. ESG

frameworks in the GCC are often driven by international frameworks like Refinitiv and SASB, but suffer from low assurance and high boilerplate disclosure.

In contrast, Sub-Saharan Africa exhibits a similar governance-first maturity curve, with strong institutional emphasis on compliance, ethics, and board structure. According to (Kogi et al., 2025) environmental disclosures are highly sector-dependent (e.g., extractives vs. services), while social disclosures remain the weakest, especially outside South Africa. The lack of standardized ESG metrics, low regulatory enforcement, and capacity constraints in both public and private sectors remain dominant barriers.

Our findings in Morocco reflect a similar regional pattern: relatively stronger governance scores, uneven environmental performance, and notably sparse social disclosures, particularly in quantitative terms. This triangulation with regional ESG profiles reinforces the contextual validity of our results, and suggests that Morocco shares structural ESG reporting bottlenecks with other emerging and frontier markets. These insights underline the importance of strengthening social reporting frameworks, and potentially harmonizing national ESG mandates with regional best practices.

While Equal weighting approach is appropriate for the current Moroccan context, future research could refine this approach by introducing expert-informed or sector-specific weights as data availability and reporting standards improve.

However, as future perspectives, several could expand this knowledge, by extend the model to non-index Moroccan firms or SMEs. Also Incorporate longitudinal data (multi-year ESG trajectories) and/or comparing results using alternative MCDM methods (e.g., AHP-TOPSIS hybrid, ELECTRE, or VIKOR). Moreover, integrating ESG with financial data science and time-series analysis can enhance alpha generation and investment decision-making in constrained settings (Sorathiya et al., 2024) such as the case of the emerging markets.

Future refinements of the model could incorporate expert judgment (e.g., AHP-based weighting) and stakeholder input to reflect sector-specific ESG materiality. Initial consultations with Moroccan ESG practitioners (e.g., asset managers and AMMC officers) indicate strong demand for such localized adjustments.

4. Conclusions

This study contributes to the growing body of literature on ESG performance evaluation in emerging markets by proposing and empirically applying a simplified, indicator-based assessment framework tailored to the Moroccan context. Using publicly available data from 20 companies listed in the MASI ESG Index and employing the TOPSIS method as a robust Multi-Criteria Decision-Making (MCDM) tool, this research successfully identified key patterns, performance gaps, and strengths in ESG reporting and implementation.

The findings demonstrate considerable variability in ESG maturity among Moroccan listed firms. Governance-related indicators were the most widely disclosed and scored highest overall, suggesting the impact of regulatory obligations and sectoral standards, particularly in financial institutions. In contrast, the environmental and social pillars revealed significant gaps, especially in GHG disclosures, diversity metrics, and turnover reporting, highlighting the ongoing challenges of non-financial data standardization and transparency in data-scarce environments.

By ranking companies based on a composite ESG performance score derived from 12 normalized indicators, the TOPSIS analysis distinguished a group of ESG leaders from underperformers, providing a replicable and objective benchmark for investors, policymakers, and corporate managers. The results also reinforce the potential of simplified, transparent ESG scoring models in supporting market-based accountability and improving

sustainability-related decision-making, especially in contexts where conventional ESG ratings are inaccessible or unreliable.

Despite the robustness of the methodology, the study acknowledges several limitations, including reliance solely on publicly available disclosures and the equal weighting of indicators. Future research could refine this model to expand it to include longitudinal data, or apply it to broader firm populations, including SMEs and non-index entities. They could explore the longitudinal impact of macro-economic shocks, such as the COVID-19 pandemic, on ESG disclosure practices and firm performance in emerging markets, given its recognized influence on corporate reporting. Furthermore, they could also explore econometric models using these derived ESG scores as dependent or independent variables to further investigate their drivers or consequences for firm outcomes, building upon the present framework.

To further enhance the generalizability and external validity of our model, future research could explore several avenues. This includes expanding the sample to encompass a broader range of Moroccan firms, including non-index constituents, as data availability improves. Longitudinal analysis over multiple periods could also provide insights into the dynamic evolution of ESG performance and reporting. Furthermore, if proprietary data access becomes feasible, a direct comparison of our framework's rankings with established external raters (e.g., MSCI, Refinitiv) using Spearman rank correlations would offer robust external validation.

Overall, this paper affirms the value of data-driven ESG assessment in emerging markets and underscores the importance of both regulatory advancement and corporate commitment to comprehensive, standardized, and material ESG disclosure practices.

The model's transparency, replicability, and low-data requirements make it especially valuable for institutional investors, ESG analysts, and regulators operating in underdeveloped disclosure environments. Future applications across peer markets may support regional ESG harmonization, offering a stepping stone toward greater sustainability integration in capital markets across the Global South.

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